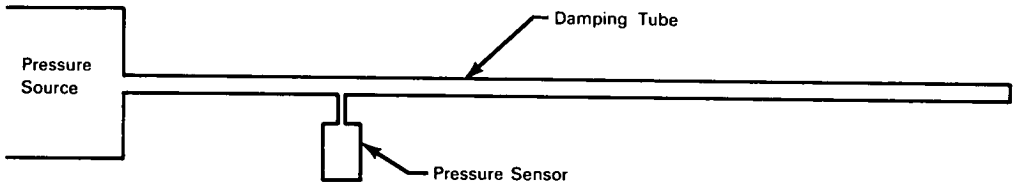
October 1965

Brief 65-10301

NASA TECH BRIEF

Remote Rapidly Varying Pressures Accurately Measured



The problem: To measure transient or rapidly varying fluid pressures in situations where it is not practicable to locate a pressure sensor at the point of disturbance. When a tube of finite length is used to transmit the pressure waves from the point of disturbance to a sensor at the other end of the tube, acoustic resonances introduce measurement errors. Although for such an arrangement resonances could be damped to a minimum level by using an extremely long tube, attenuation of the pressure wave would be excessive.

The solution: Use a transmitting-damping tube of sufficient length, with one end open to the pressure source and the other end closed. A pressure sensor is connected to a port in the tube at a point as close as practicable to the pressure source.

How it's done: The length of the tube is determined from the pressure parameters and maximum allowable resonant frequency. The cross-sectional area of the tube must be held constant over a length extending from the sensing point to a point downstream where the attenuation is sufficiently high. There will be some attenuation of the pressure wave as it travels from the pressure source to the sensor and also a transit-time delay. The errors from these causes, however, will be less than the errors caused by resonances in a tube terminated at the sensor.

Notes:

1. Application of this system is indicated for measurement of remote dynamic gas pressures at frequencies above 100 cps. It has been used for sound-pressure measurements under conditions where the microphone could not be located at the point of disturbance.
2. The attenuation from the sensor to the capped end of the tube must be high enough to prevent an appreciable echo from returning to the sensor. The attenuation can be increased by adding damping material, tapering the tube, or making part of the tube of acoustic-absorbing material.
3. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Flight Research Center
   P.O. Box 273
   Edwards, California, 93523
   Reference: B65-10301

Patent status: NASA encourages commercial use of this innovation. No patent action is contemplated by NASA.

Source: General Electric Company
under contract to
Flight Research Center
(FRC-28)
Categories 01, 02, 05